STONE ART AND ARCHITECTURE: MANUFACTURE OF STONE TEMPLES, HOUSES, UTENSILS, JARS, TUBS AND OTHERS: THE TECHNOLOGY BEHIND AND THE TOOLS USED

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Introduction: Nadigudem has been situated in a hilly area with Paleolithic cultural evidences. M.L.K. Murthy[1] has pointed out the presence of prehistoric men with the discovery of dolmen and Paleolithic axes at Nadigudem, Nalgonda district.

Indians and Stones: Interestingly, Indians like stones so much that they occupy part of their life in many aspects.

- In India, even today, they use stone implements stone mill/ roller-stone / grinding stone (for grinding grains converting into flour), stone mortar (Kallural), Hew and Pick Grinding stone (Kallupoliya), Stone jar (Kal-jadi), etc., for different purposes, mainly forming part and parcel of (traditional) kitchen.
- In many games, stones are used characteristically (stone-dice, stone-bar, stone-marker, etc.) – a kind of backgammon board / dice-play (Thayam / Thaya-katta), a tablet with 14 holes to play (Pallanguzhi), mock-fighting with Tiger (Adu-puli), a game of six-stone spheres (Aru-kallu) etc.
- Washing cloths by striking, sharpening domestic knives, …involve stones.

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- Even in many ceremonies, particularly, in the last rites, stones are symbolically used. Moreover, in vocabulary of Indian languages, hundreds of words are available specifically connected with stone. Of course, the importance and usage of precious stones has been unique culture and tradition.

Thus, from birth to death the stone formed part and parcel of Indians involving with daily routines, activities and duties.

Deification of stones – from temple building to town-planning: At one point or the other, the stones naturally available were considered divine and hence men converted them into venerable objects. The saligramas, pillar-like structures, cylindrical stones etc., became specific Gods adorable and objects of worship. Here, devotees do not bother whether the divine objects were animate or inanimate, as through, mantras, they invoked their God to come down, reside and bless them. That the inanimate stone becoming animate is made an axiom[2], "Vastu rewa vastu." The colour of the God also changing from black, blue, green and white. In other words such coloured stones were chosen to represent specific murti / God of their choice. Vaishnavites represent Salaligramas in 24 categories. Saivites worship Linga that has origins in IVC and supported by Vedic literature. Mukhalingam, Astottra-sata and other categories are there. During the medieval period, Lingothbava murti was also developed[3]. The Brahma had always gone with Trimurti and and four faced Lingas. The organized temple building had gone with the town-planning. Thus, Indian art and architecture cover all human and human-nature related activities.

Modern-day activities encroach and destroy stone artifacts: These stone artifacts were found till 1960s and thereafter, then, they started disappearing because of urbanization, infrastructure development[4]. The highway expansion of converting roads into four-way, six-way etc, they were either removed, demolished and disappeared or made to forget what

happened. Not only stone tubs, granite troughs, mantaps, but also many temples disappeared. When dams were built many villages and temples were either displaced or disappeared. The temples with many sannidhis and pragaras spreading over vast land as "Temple-complex" have been reduced to smaller ones with the encroachment of temple land by others. Thus, now people see the strewn sculptures, broken idols and falling pillars and many amateurists claim that they "discovered" medieval sculptures, temples and so on. Moreover, there has been another menace in Tamilnadu, particularly, where, these iconoclasm has been carried on under the guise of "Dravidian analytical wisdom" and so on. Now, it has resulted in mantap and temple demolition, idol smuggling and so on. The stone cutters, polishers and other works, stapatis and experts have virtually lost their jobs. They have to switch over to other jobs and slowly started forgetting their traditions and art.

Lithic culture, metallurgy and chronology of the people involved[5]: The lithic culture was / is closely associated with metal, and metallurgical science and technology.

The presence of man in India and his handling of stones date back to millions of years back. In fact, scholars have not been definite about fixing Stone Age to India. F. E. Zeuner[6] considers that, though no classification applicable to the whole of India is possible, a rough guide is:

- **Neolithic**: Passing upwards into the Asoka period (274 BCE) and downwards into Indus valley culture (about 2300 BCE) and beyond).
- **Microlithic**: from the late Pleistocene to pre-historical.
- **Paleolithic**: from about 5,00,000 years ago to the end of the Pleistocene.

The archaeologists divide lithic culture into Paleolithic, Mesolithic, megalithic, Neolithic, chalcolithic and so on. Incidentally, the megalithic culture is linked with iron age and bronze also. The iron and steel has impact on the stone

technology. However, they cannot fix the dates of development of metallurgy exactly with that of lithic culture. It differs within a civilization at a time and place and therefore, the civilizations developed at different places cannot be compared chronologically. Indus Valley Civilization (IVC) poses many challenges to all, as its ancient layers with material evidences dated to 9000 BCE, peak period 2250-1950BCE, whereas the historical period starts from 326 BCE, that too, with Asoka 274 BCE. In other words, the illiterate people of IVC only produced such highly technical bronzes, sculptures, houses with all moder facilities, cities and town-planning. Such bias is exhibited in dating the stone art and architecture also.

Stone Art and Architecture – Its Style, relative dating etc: Identification of certain features, characters and design and associating them with a particular race, tribe, dynasty, empire and taking it as a "style" or "standard" and fixing the date or chronology accordingly. Here, many assumptions and presumptions are made. Cunnignham dated certain monuments found at Taxila as belonging to 2nd and 3rd centuries CE (ASR, Vol.V, Plate.xxiv), which was disputed by J. H. Marshall. Fergusson dated to 8th cent. CE (1910, p.98, fig.27), so Marshall[7] questioned him also as his woodcut was a mere travesty of the original.

"The attribution of this monument, as fitment, as it now stands, to the eighth century or thereabouts by Fergusson is one of the most amazing as his attribution of the Dhamekh stupa at Saranath to the eleventh century. The style of the architectural decorations around the plinth and base of the super-structure is precisely that which prevailed at Taxila in the second century AD, but was completely transformed during the three succeeding centuries"

So scholars like Fergusson and Marshall could differ by 600 years in dating of the same Indian monuments by their "exhibited style", what would have happened in the case of others? Warmington,[8] who published a silver dish from

Lampsacos (ancient name Lapseki), Asia Minor depicting "Bharata-Lakshmi" dating to 1st or 2nd century CE based on the features exhibited in the figure. V. S. Agrawala[9] discussing it states that the style of hair depicted – coiffure was found among the Roman women during 1st or 2nd century is not known. However, such style appears in the terracotta figures of Gupta period dated to 4th century (or 3rd cen. BCE). Thus, even the surmise has a difference of 3 or 2 centuries gap, if one has to date sculptors by the style. D. R. Bhandarker[10] also points out the lacuna in deciding the date of the monuments based on the style:

- Different ways of reading letters and script in the inscriptions. SAKA is read as SAN, SANAB, and so on and Kanishka as KARANO, KANAK, KANIK and so on (p.272).
- If one goes by Paleolithic evidence i.e, reading of letters / alphabets in the inscriptions based on style, The Guptas are made contemporary rulers of Kanisha (p.300).

Again, the difference would be 400-500 years. Therefore, in history and hisroriography, the difference of 300-600 years woukd play havoc. Yet, Indian history has been constructed with such inaccurate estimations, surmised relative datings and wrong chronologies, leading to conflicting, confusing and confronting history. Therefore, the monuments have to be independently dated with scientific methodology.

From rocky caves to stone houses: Initially, caves could have been the living places of men, but, slowly, they started building their own shelters developing into different types of houses. The Jains and Buddhists used caves for their activities. Moreover, their practices of digambara, mantra-tantra-yantra and other practices made them excluded from the cities, towns and villages. The usage of stone has been important in any type of building activity. The granite slabs were used as beams, rafters, joists and lintels in every house building activity. Even windows and doors, door frames of them, sun-shades, pipes, tubes, fittings and chimneys were made of stones. Roofs were

generally laid by stone slabs, till they were replaced with bricks and wooden rafters. Hand-rails, steps, pillars, and others were made of stone slabs. The same pattern was followed in building mantaps, palaces and temples. In IVC itself, all these examples have been found.

Monolithic / rock-cut temples, cave temples: Rock-cut architecture has been carving out the required three dimensional structures with all minute details of geometry with perfection. The Indian rock-cut technology appears to be unexplained with any principles of modern science and technology. The details such as - how the engineers visualized, formed the details of the structures to be built, where they kept such drawings and details, what tools and implements used to scoop out the stalk of the material, how the carving started, how and where the scooped out material removed and dumped and nothing is available. The marvelous, astonishing and mysterious stone-working has been noted by the writers, but perplexed to explain the technology behind it. For example note the observation of James Fergusson[11]:

"*Frequently the capitals and shafts have been actually turned in a sort of lathe in which the shaft was held vertically*". (p.425).

About the Chalukyan sculptures, Meadows Taylor[12] surprised as follows:

"*…….the carvings on some of the pillars and of the lintels and architraves of the doors are beyond description. No chased work in silver or gold could possibly be finer……..By what tools this very hard, tough stone could have been wrought and polished as it is, is not at all intelligible at the present day; nor indeed from whence the large blocks of greenstone rock was brought*".

That is generally, the work-piece in the lathe would be placed horizontally, therefore, placing vertical is unimaginable. The historians, archaeologists and researchers should find out for 40' pillars, what type of lathe, chuck and tools would have

been used. Though, such machine tools have been recovered so far, the material evidences available stand proof to the effect that there were available. Some of the important monolithic / rock-cut temples, temple complex and structures are tabulated for illustrative purpose and appended (See appendix -I).

The movement of people and transport used: The movement of people in Indian had been there for more than 5000 years and definitely, there was some sort of transport system covering thousands of kilometers distance. When, priests, merchants and warriors had gone to Southeast Asian countries crossing the ocean, there is nothing strange for the land route transport system existed. Though, they had covered distances by walking, definitely, horses, bullock carts and horse driven vehicles were used. Incidentally, there were chariots with stone wheels operating till 18th-19th centuries in temples[13]. However, as the wheels were heavy, they might have been used for specific hard and difficult roads / routes. And of course, the national high ways and other roads were there for travelling and transport. The movement of salt loaded bullock carts going to north was faithfully recorded in the Sangam literature[14]. The common people were travelling covering distances for the purposes of pilgrimages, attend festivals and fairs and other functions. Thus, for night stay of the travellers, vehicles, there were shelters built all along the roads and high ways, as evidenced by the mantaps found at equidistance.

Mantaps for the stay of travellers, luggage-rest-stones and stone tubs: As lakhs of people were moving here and there, periodically, for many exigencies, undertaking long distance travel also, there were mantaps, luggage-rest-stones and stone tubs. They were made of stones. The mantaps were just like inns, transit rest rooms or motels, where, they could stay, take rest and sleep during night and uncomfortable weather conditions and then proceed. The luggage-rest-stones were for keeping their luggage temporarily, while taking rest. Here, there were two categories open and closed. The open ones could be seen on the road sides and closed ones inside the mantaps.

That there were rooms inside mantaps show that there were separate sleeping place for women. The stone tubs were meant for providing water to the travellers for drinking, bathing and washing. Besides. All these facilities, food was also offered. However, all these facilities were free for the travelers and pilgrims. These practices were followed till 11th-19th centuries. There were inscriptions about these facilities offered by the government officials and philanthropists.

Famines and the Gruel-stone troughs during the British colonial period[15]: As the colonial forces including the British started fleecing the Zamindars and in turn farmers, there were famines during 18th and 19th centuries leading to death of millions of innocent poor people. At that time, the local Kings, chieftains, philanthropists, traders and others out up "Kanji-thotti," Gruel trough from which the food was distributed to the famine-affected starving people. They also inscribed on them specifically mentioning the names of the donors and the purpose. Therefore, it could be noted that during the period, the demand for stone-tub, stone-trough increased with the demand. Noting the gravity of the condition, the British also resorted to such provision. Incidentally, when they put up one trough near Stanely Hospital, Madras, it was known as "Kanji-thotti hospital." Earlier, in 1781, that place was known as "Kanji-thotti Sattiram," i.e, the Gruel –trough staying place, where, the old people used to stay and spend time. When the troughs were used in 1891-famine, it was figuratively mentioned as "Kanji-thotti pancham," i.e, Gruel-trough-famine. In any case, the usage of monolithic tub / trough could be noted. Now, other examples are discussed.

Bridge made of a single stone[16]: The Namdang Stone Bridge is a historic bridge located a few kilometers away from Sibsagar town in Assam, India. It was constructed in 1703 by craftmen brought from Bengal during the reign of Ahom king Rudra Singha. The bridge is 60 m (200 ft) long, 6.5 m (21 ft) wide and 1.7 m (5.6 ft) high. It runs over the Namdang river, a tributary of the Dikhou river. The present National Highway 37 is passing over it. The unique characteristic of the bridge is that it was cut out from a

single solid piece of rock hundred years of age. The bridge is a little curved in shape. During the time of Ahom kings cement was not in use for construction. A paste of Bora (sticky)rice, duck eggs, black lentils and lime was used to make the bridge. The bridge connects Sibsagar town to Jorhat and other districts in the west. This example again proved that the technology was in vogue even in 18th century, till, it was taken over by brick structure and then by concrete.

How these stone tubs were manufactured?: There are stone tubs, troughs and bowls also. In the Hajo temple complex, District Kamrup. It's around 30 kms from Guwahati, Assam, one huge stone bowl is found known as Bimar choriya or Bhina's bowl. It is believed to be a bowl in which Bhima Mahabharataharta used to eat his food. According to Mahabharata and Puranas, Bhima married Hidimba, a tribal princess, during his exile and spent time in the North East[17]. Now when modern men look at these stone tubs, utensils etc., they are surprised to note as to how they could have been manufactured and what type of tools were used to carry out such processes involved in the manufacture. How they were carved out of a single stone block or whether stone slabs were joined together by applying any resin or such bonding material. The stone utensils, domestic appliances, jars, flasks posed many questions. Today, many tools are used to manufacture the very same goods. Thus, it is evident that the ancient and medieval manufacturers must have had similar tools. There have been palmleaf books that describe the manufacturing processes.

Stone lamps of different varieties used[18]: Here, it has to mentioned about the light arrangements made during the evening and night times till dawn. There were stone-lam posts erected at the cross-roads and important junctions and places. Covered and open lamp-posts were used. For which, the rulers appointed specific people to light the lamps oiling regularly. Different types of oils were used specifically, to ward off mosquitoes, insects and pests. In houses, palaces and temples, lanterns and other lamps were used. That different types of

lamps made of stone and ceramics were used could be noted from the archaeological findings also. Inscriptions always mention that kings, queens, chieftains, traders and others donated for keeping and maintenance of the perpetual lamps in the temples. Stone lamp posts are still used at many places, because of their easy availability and long lasting nature.

The stone artifact that enthralls others: Now, some stone artifacts are discussed that enthrall all. The stone chain, that too, with a bell, fascinate as none could understand as to how it could have been carved out of single stone. Anyone is at loss how the links were made converting to a chain and then the bell attaché to it! The chain links are of the same size joined together. What type of tools were used to scoop out the material to produce the tong hanging and attached to the chain. And the whole "assembly" was done without any breakage. Perhaps, even with modern machines and tools, it could not have been manufactured. The "chained bell" is at the "Tiruval eswaram" Shiva temple situated at Brahmadesam, 4 kms north of Ambasamudram, Tirunelveli district, built by Rajaraja - I.

Stone vessels, utensils and flasks used for food, medicine storage and hospitals: In hospitals, for the storage of different mixtures, various liquids, extracts and medicinal preparations, varied vessels, utensils, flasks, jars etc were used. So far, no study has been made about the nature of stones used. For storing pickles, soft stone jars were used, where they could be stored without getting effected for one year. As they have been slowly replaced with ceramic ware, they disappeared. Chess, coins, and other board games, different parts were used and they were manufactured with stones. Thus, as stones were used for different uses, they were continuously utilized. The men were also employed for the purposes at various levels. Though, nowadays, the domestic appliances like grinder etc., have been miniaturized, stone has not been replaced. However, the business ethics has come down with reduction of stone size.

The availability and selection the stones for Idols: Even among the black stone category, the dark black-blue is chosen for Idol-making, particularly that is installed in the sanctum sanctorum. Besides the Silpa Sastra rules, by experience, the Stapati chooses the required stone[19]. The following details are given for illustrative purposes to understand how stone is selected. The particulars of the collection of stone have been described as follows: The chief architect (sthapati) together with the assistant workers (sthapaka), the master, and his retinue, after getting up in the morning, would go to a hill or a forest on an auspicious-moment of good constellation, and collect stone. After the collection, they place the stone on a wagon (lit., chariot) and convey it to their place of work. If the stone is covered by leaves, burnt by fire, disfigured by being fallen into a pit, or licked by the sun (shines), it would be rejected. The selected stone without blemishes would be placed positioning with the cardinal points. All those stones which lie lengthwise in the four directions are known as male. Those lying lengthwise in the four corners are called neuter. All the huge pieces of stone keep occupying the earth and the sky.

Selection based on shape, sound and colour: The male stone is said to be quadrangular, and the female circular; and when it has many horns (elevations) it is called neuter. That which sounds like the bell metal is called the female stone. When it sounds like the jewel-box, it is known as the male stone. All the stone which is soundless is known as neither female nor male (i.e., neuter). When it sounds like the musical tone (tala) it is called the creeper-stone. That is called the tree-stone (vriksha), when it sounds like the buffalo. Those (stones) which sound a half of the aforesaid should be the barley (yava) stone. All those stones which are circular should be reared as grain (sali). Besides the stones have colour, white, red, yellow, and black, if they have black lines in them, they should be avoided. The stones with the White and gold lines are auspicious and conducive to all prosperity.

How and why the black stones are chosen for the manufacture of Divine Idols?: If a temple is looked at, almost most of the parts, structure and compounds have been built with stones of various sizes, shapes and colours. As for as the divine Idol manufacture, Silapa sastras mandate usage of specific stones for the purpose. Actually, the stones are divided as follows:

1. Masculine

2. Feminine and

3. Neutral.

The sculptors, stapatis and experts identify recognize and select such stones by carefully looking at the structure, sound produced when tapped with finger and surface changes when applied with water, oil and other liquids. According to them, the stones have life, nerves mind and all. There are stones with seven colours, which are in turn categorized into 49 varieties of stones. Of which, the required stone is selected with the above tests.

1. The male stones are used for the manufacture of Male deities / divinities.

2. The female stones are used for the manufacture of Female deities / divinities.

3. The neutral stones are used for the manufacture of steps, pillars etc.

The female stones are used to grind, scoop and carry out other operations with male stones. The sculptor and all others involved in Idol-making to temple-building should be disciple, devoted and faithful to work, besides well-versed in Silpa sastras.

The machines and tools used in the granite manufacturing factory: How 40' pillars were manufactured, that too, with carvings on them without any mismatch. What type of lathe or rotating machine was used to manufacture such pillars. The fact that the pillars are available prove that some machines had been

there to manufacture. Then the question of tools - chisel, drill, shovel, spade, etc., used for cutting, chiseling, incising, scooping, designing, polishing etc. In granite slabs and monuments manufacturing factory, many machines are used for cutting, chiseling, leveling and polishing. Here, machines do more work than men. And there have been "Profile / facsimile cutting machine" that produce required figures based on the computerized programs. Whenever, any mistake is there or breakage is there, they are adjusted with sticking together with special resin / bonding material. Then, they are refurbished and polished so that such mistakes could not be noted. Here also, though all have been man-created, the machine-produced artifacts cannot be equated with the man-created ones with high skill and creativity.

The dating of Manasara, Mayamata and other Sanskrit works: Ram Raz opined that the existing manuals of Indian art and architecture were from South India and the manuscripts were not available in complete form. From the internal evidences found, particularly about the mention of the Four Saivite Great Nayanmar, Pandyas etc., he tried to fix the date to 3rd to 5th cent.CE[20]. However, P. K. Acharya pointed out later that many palm-leaf mss were discovered. He gives hundreds of such works in his monumental work on Indian architecture[21]. He discussed about "Age of the Manasara," and fixed its date to c.500-500 CE based on the Malwa king named Manasara[22]. Ram Raz pointed out that H. H. Wilson placed the work to 300-400 BCE in one place and to c.1000 BCE in another place[23]. Bruno Danens[24] dates to 11th century, as it mentions about imagined 16 storied temple, perhaps after getting inspiration from the "Big Temple" of the Cholas! He puts it characteristically:

"*Our text however must be earlier and may have been written between the definitive elaboration of the false storey option and the appearance of the very big temples of this type, as those of Tanjore or Gangaikodacolapuram*".

P. K. Acharya dates it to Gupta period i.e, c. 4th century. T.

Bhattacharya[25] points out that the present text is dated to later period, as the original text has been subjected to editing, which the modern scholars used to say that it is a recension of recensions, which is to say, a late and protracted version drawn from a less 'complete' original and from numerous other sources. P. P. Apte[26] points out that Paushkara Samhita, one of Pancharatra Agamas is dated to 3rd to 5th Cent.CE. However, they do not mention where the original "Ur-Manasara" is there and how it has been dated, how it is 'incomplete', edited, appended, updated or upgraded by others when where and whom etc. Whatever the enlargement may be the existing texts / books written or copied from the originals, the existed could not be denied. It has to be noted that Indian scholars and writers always acknowledge the source of their derived knowledge and wisdom. Therefore, such quality of due acknowledgement could not make the earlier sources imagined or non-existed ones.

The preference, uniqueness and usage of stone for all purposes: From the above discussion, the points are summarized as conclusion:

1. The Indian selection of stone for many purposes in the art and architecture has been unique. Researchers note that not only the historians, archaeologists and art experts differ in dating IVC, IVC artifacts, Vedic civilization and literature, but also in dating available stone art specimens of all forms.

2. Stone has been formed with the creation of earth as a part of Panchabhutas. As human body with life has been made of Panchabhutas, the stone has been unique, pure and lasts forever. Thus, anything made of stone, preserved in stone, lived with stone would have long life without degradation.

3. Sila was considered divine and 'Salagrama' is treated and worshipped as 'stone-god,' nature carved Idol of God manifested.

4. Thus, the Vedic people referred to live in forests and hilly areas, so that they could get all their requirements.

5. The Jains and the Buddhists differed, thus, they located their paces at remote places at the hilly places and viharas. They had to come to villages and cities for their requirements.

6. Thus, the stone art developed and progressed in one way or the other, giving employment to thousands of people.

7. During their periods, the quarrying and deforestation were undertaken in a balanced way, so that there were no ecological imbalances. As population increased, cities multiplied, imbalances had crept into.

8. Modern methods of exploitations, including quarrying and infrastructure development activities make many monuments disturbed, displaced and disappeared.

9. The uniqueness of /Indian stone art expertise, skill in the carving, particularly rock-art architecture and other features has bee unparalleled. Whether the material evidences came first and the architectural manuals composed later or vice versa, both had been in existence definitely 2000 to 5000 YBP depending upon various experts, different theories and varied chronologies.

10. In any case, the Indians have been so fascinated with stones and rocks of all forms, used and benefited by their use, and lived with them, that they have not disturbed the ecological imbalances, as modern men do.

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2. The word Maansaar has unique meaning of the act/ science/

standard / system of measurement. The Vastushastra has adapted and adopted the meaning in its subject.

3. This actually shows the superiority of Shiva over Brahma and Vishnu mixing the Puranic narratives to create a new story to support such depiction.

4. In Tamilnadu, many would have been eye-witnesses as to how thousands of trees were uprooted, temples, mantaps and ancient structured demolished and disappeared etc., when travelling from Madras / Chennai to Pondicherry, Trichy, Madurai, Tiruvannamalai, Bangalore and other places.

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11. James Fergusson, History of Indian & Eastern Architecture, Low-Priced Publications, New Delhi, 1997, pp.422-423.

12. Meadows Taylor and James Fergusson, Architecture of Dharwar and Mysore, John Murray, London, 1866, pp.47-48.

13. Deloche, Jean. The Incredible Survival of Stone Wheel Manufacture in South India. In Indian Journal of History

of Science, Indian National Science Academy, New Delhi, Vol. 53, No..2, 2018, pp.232-240.

14. Ettuttogai and Pattuppaattu give references about the salt-loaded bullock carts going to north [north India], where, the salt manufactured from sea waters was not available.

15. 1791-92 – Doji bara or skull famine; 1876-78 – great famine/ South Indian famine of 1876-78; Indian famine of 1896-97.

16. The details are taken from the following site. They are available in Wikipedia also. https://web.archive.org/web/20090604121320/http://www.mapsofindia.com/assam/tourism/namdang-stone-bridge.html

17. The Buddhist also lay claim to this stone basin. Wendell in his studies (with references from Tibetan and Bhutanese Buddhist texts) mentions that the Buddhists believe that this is the pot where Death Demons boiled the heads of the Damned, this is the place where snakes lived. This shows how the rival faith manufacture new myths to claim space and force their belief on others.

18 Prasanna Kumar Acharya, Architecture of Manasara – Translation in English, Vol.IV, p.503

19 Prasanna Kumar Acharya, Architecture of Manasara, Chapter LII, Oxford University Press, London, 1933, pp. 532- 534

20 Ram Raz, Essay on the Architecture of the Hindus, Royal Asiatic Society, London, 1834, pp.9-10.

21 Under Appendix-I, he gives 'A Sketch of Sanskrit treatises on Architecture' running into hundreds, A Dictionary f Hindu Architecture, Manasara Series – I, pp.749-804.

22. P. K. Acharya, Indian Architectute according to Manasara Silpa Sastra, Manasara Series – II, Chapter.V, pp.160-198.

23 Ram Raz, Essay on the Architecture of the Hindus, Royal Asiatic Society, London, 1834, p.10.

24 Bruno Dagens, Mayamata, Sitaram Bharatia Institute of Science & Research, New Delhi, 1995, p.v in Introduction.

25 T. Bhattacharya, The Cannons of Indian Art, Calcutta, 1963, pp.183-195.

26 P. P. Apte, Pauskra Samhita, Rashtriya Sanskrit Vidhyapeetha, Tirupati, 1991.

Appendix-I

Name	**Type, group, cave or temple**	**Date / period / dynasty**	**State**
Barabar, Lomarishi caves	Lomas Rishi, Sudama, Karan Chaupar, Viswakarma, Gopika, Vadathika, Vapiyaka	c.1000-500 BCE	Bihar
Masroor Cave Temples,	Near Masroor lake Also known as Himalayan Pyramid, Masroor Rock Cut Temple is a complex of 15 monolithic rock-cut monuments.	early 8th- century (relative dating, compared)	Kangra Valley of Beas River in Himachal Pradesh
Varaha Cave Temples	The most eminent statue in the cave temple is of Lord Vishnu, which incarnated in the form of a Varaha or boar elevating earth from the sea.	7th century, Pallavas	Mamallapuram of Tamil Nadu
Kanheri Caves	These caves feature Buddhist sculptures along with relief carvings, paintings and inscriptions. Kanheri comes from the Sanskrit Krishnagiri, which means Black Mountain	dating back to the 1st century BCE to the 10th century CE.	Maharastra
Badami Cave Temples	complex of four majestic temples	dates back from 6th century, Badami Chalukya architecture.	northern part of Karnataka.
Ellora Caves	comprised of 34 caves. combination of Hindu, Jain, Buddhist rock-cut temples.	Rashtrakuta dynasty	Aurangabad district of Maharashtra
Ajanta Caves	Buddhist temple complex that comprised of 30 rock-cut Buddhist cave monuments.	2nd century BCE to about 480 CE in	Maharastra
Elephanta Caves	two groups of caves, including five Hindu caves and two Buddhist caves.	placed between 5th and 7th centuries	Elephanta Island of Maharashtra
Udayagiri Caves	consists of some of the most ancient Hindu Cave Temples. The cave complex is comprised of 20 caves, including 1 of Jainism and 19 of Hinduism.	5th century CE	Vidisha, Madhya Pradesh,
Udayagiri and Khandagiri Caves	Udayagiri has 18 caves and Khandagiri has 15 caves. Various religious inscriptions are done on these caves.	2nd-century BCE.	Orissa

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